Postel

NETWORK WORKING GROUP
REQUEST FOR COMMENTS #339
N.I.C. #9932

R. Thomas
BBN
May 5,1972
Rcvd 22 May 72

MLTNET - A "MULTI-TELNET" SUBSYSTEM FOR TENEX

INTRODUCTION

MLTNET is a TELNET-like facility for TENEX which enables a user to control a number of jobs, running on different ARPANET hosts. It multiplexes the user's local console among the remote jobs. MLTNET is useful in applications which require coordinated behavior of several network hosts. In particular, we have found it helful in debugging programs which make use of the network. The MLTNET program is designed to be easy to use and, while used in remote mode, to be as transparent as possible to the user. It is somewhat less sophisticated than the TENEX user-TELNET program. MLTNET is currently a subsystem on the BBN-TENEX host.

USING MLTNET

MLTNET operates in two modes:

1. Local Mode Operation:
   When in local mode MLTNET interprets input typed by the user as commands to it. Commands consist of a mnemonic command name followed by zero or more parameters. Included in the commands recognized by MLTNET are ones which enable the user to associate a name of his choice with a connection to an ARPANET site, to establish a connection with a named site, to list the network status as seen from the user's TENEX, etc.

2. Remote Mode Operation:
   When operating in remote mode MLTNET makes the user's console appear to be directly connected to a remote site. It transmits input typed by the user to the remote site and prints output received from the remote site. Output received from a remote site while the user is in local mode or is interacting with another remote site is buffered for the user by MLTNET.

   MLTNET has been designed to be transparent to the user while operating in remote mode. In particular, when in remote mode it transmits user-typed ↑C (CONTROL-C, the TENEX "attention" character) and ↑T (CONTROL-T, the TENEX "time used query" character) to the remote site.

When in local mode ↑C and ↑T have their usual TENEX effect.

Occasionally a user may find it necessary to modify the characteristics of a connection to a particular remote site. For example, he may want to have MLTNET echo typed input as it is transmitted. Or, he may be using a remote host which requires both upper and lower case characters from a local terminal which has only upper case; in such a case he would want MLTNET to transmit upper and lower case as appropriate. In remote mode operation MLTNET recognizes "!" as an escape character and interprets the character following it as a command to change the characteristics of the connecton currently in use. Commands recognized by MLTNET in remote mode are summarized in the next section. To have MLTNET transmit "!" to the remote site the user types "!!".

MLTNET Command Summary

Local Mode Commands

MLTNET uses the character "←" to signal the user that it is in local mode ready to accept input. Commands and command parameters may be editted as they are input. The character ↑A (CONTROL-A) deletes the last character input. In response to ↑A MLTNET types "\" followed by the character deleted. The character ↑R (CONTROL-R) causes the input string as collected so far to be retyped (with all editting carried out). MLTNET responds to the character RUBOUT (octal 177) by aborting the current input collecting operation and typing the ready character "←". The ALTMODE character (octal 175) may be used to invoke command recognition and completion. If insufficient information is available to recognize an input string as a command MLTNET responds to ALTMODE by ringing the terminal bell. Any prefix which uniquely identifies a command is recognized as that command by MLTNET.

In the following, <name> and <site> denote command parameters. They are strings terminated by a space or carriage return. <name> is a user chosen string of 14 characters or less; <site> is either the name of an ARPANET host or the string "LOCAL".

The commands recognized by MLTNET in local mode are:

ASSIGN:
   syntax: ASSIGN <name> <site>
   effect: Associates the user chosen string <name> with a connection to the ARPANET site <site>.

TALK:
syntax: TALK <name>
effect: Switches from command mode to remote mode directing subsequent console input to the site associated with <name>. If no ARPANET site is currently associated with <name>, the user is asked to specify a site. The first time the user "talks" to a particular named site MLTNET goes through the ARPANET initial connection protocol with the remote site in order to establish a duplex connection with it.

NAMES:
syntax: NAMES
effect: Prints on the console the <name>/<site> associations currently known to MLTNET.

QUIT:
SYNTAX: QUIT
effect: Returns control to the TENEX EXEC breaking all connections with remote hosts. It is good practice to log out of each remote host before using the QUIT command.

NETSTAT:
syntax: NETSTAT
effect: Prints on the console the network status as seen from the local TENEX.

RENAME:
syntax: RENAME <name>1 <name>2
effect: Associates <name>2 with the ARPANET site previously associated with <name>1.

FLUSH:
syntax: FLUSH <name>
effect: Breaks the network connection with the ARPANET site associated with <name> and, in addition, breaks the association between <name> and that site.

HOSTS:
syntax: HOSTS
effect: Prints on the console the list of hosts currently known to the MLTNET subsystem.

HELP:
syntax: HELP
effect: Prints on the console a brief summary of how to use MLTNET.

Remote Mode Commands

In remote mode MLTNET recognizes the escape character "!" as a signal to interpret the following character as a command. Currently MLTNET recognizes the following characters as commands to it:

Q: (quit) Causes MLTNET to switch from remote mode to local mode.

L: (local echo) Causes MLTNET to echo characters as it transmits them to the remote site. ;L is the inverse of R. The default case.

R: (remote echo) Causes MLTNET to transmit characters typed to it without echoing them; the inverse of L.

U: (upper case) Causes MLTNET to transmit upper case letters as typed; the inverse of S. The default case.

S: (small letters - lower case): Causes MLTNET to transmit upper case letters typed to it as lower case letters. In this mode of operation "↑" acts as a shift key; "↑" may be transmitted by typing "!↑". S is the inverse of U.

X: (where X is any character other than Q, L, R, U or S): Causes MLTNET to transmit X.

The following is an annotated scenario which illustrates the use of MLTNET; in it characters typed by the user are underlined.

```
@MLTNET

MULTI-TELNET

-ASSIGN
NAME: R
SITE: RAND-CSG

-TALK
NAME: A
SITE: BBN

!D!C
 BBN-TENEX 1.29, SYSTEM-A EXEC 1.38
@LOG NETPLANES  11514
 JOB 12 ON TTY101  5-MAY-72 11:45
@
```

*Assign name R to site Rand-Csg

*Talk to A. Since A is not yet associated
*with a site, MLTNET asks for a site name.

*Log into site A.

*Type "!Q" to return to MLTNET local mode.

```
-TALK
NAME: R

 TENEX 1.28, RAND EXEC 1.33.1
@LOG BTHOMAS
  (PASSWORD)
[illegible]
(ACCOUNT #) 1

 JOB 2 ON TTY35 5-MAY-72 8:56
@
```

*Talk to R. Since RAND-CSG has been previously
*associated with R, MLTNET immeditately
*switches to remote mode.

*Log into R.

*Type "!Q" to return to local mode.

```
-NAMES

A               BBN
R               RAND-CSG
```

*List set of names known to MLTNET.

```
-TALK
NAME: A

DIR MNA.REL;* .
@@VERBOSE  ?
@@

   <NETPLANES>

                                        PGS WRITE      READ

 MNA.REL;8;P777752;A11514                 2 11-MAR-72  5-MAY-72

@COPY MNA.REL;8 (TO) NET:100.RAND-CSG-4100100 [OLD VERSION]

-TALK
NAME: R

COPY NET:100.BBN-25300100 MNA.REL;$1 [NEW FILE]

@DIR MNA.REL;* .

@@VERBOSE

@@

   <BTHOMAS>

                                        PGS WRITE      READ

 MNA.REL;1;P777752;A1                     2  5-MAY-72  5-MAY-72

@ USED 0:00:02.0 IN 0:03:23

-   USED 2.936 SEC. IN MULTI-TELNET
NETSTAT

HOSTS? Y
CONNECTIONS? N

HOSTS UP:
SRI-ARC
UTAH-10
```

* Initiate a file transfer from
* BBN-TENEX to RAND-CSG. Then type
* "!Q" to return to local mode.

* Complete the file transfer.

* Type "↑T" while in remote mode
* MLTNET transmits it to R.

* Type "↑T" in local mode. MLTNET
* reports time used.

* Request netstatus as seen by
* MLTNET.

```
MITRE-TIP
NBS-TIP
ETAC-TIP
USC-TIP
GWC-TIP
BBN-TESTIP

-    USED 3.272 SEC. IN MULTI-TELNET
TALK
NAME: UCLA
SITE: UCLN\NA-NMC
UCLA-NMC
CAN'T MAKE CONNECTION

-TALK
NAME: M
SITE: MIT-MULTICS

↑B↑B
MULTICS 16.6; MIT. CAMBRIDGE. MASS.
LOAD = 29.0 OUT OF 30.0 UNITS; USERS = 30
ENTER ↑THOMAS ↑C↑NET
YOU ARE PROTECTED FROM PREEMPTION.
ANONYMOUS USER THOMAS CNET LOGGED IN: 05/05/72  1201.3 EDT FRI FROM NETW
**ORK TERMINAL "BBNA"
        .
        .
        .
R 1202  13.623  26+1201
```

* Type "↑T" in local mode.
* Try to talk to UCLA. Use ↑A
* and ↑R to edit command parameter.
* UCLA not up at time - can't
* connect.

* Talk to MULTICS.

* Type "!S" to use lower case as
* default; ↑ causes
* transmission of
* upper case.

```
WHO

MULTICS 16.6, LOAD 29.0/30.0; 30 USERS
ABSENTEE USERS 2/2

ROACH.SYSMAINT*
        .
        .
        .
KARGER.MULTICS*
WGARDNER.CERES
STONE.MULTICS
ANONYMOUS.CNET

R 1203  3.961  42+316
```

```
LOGOUT
↑B↑B

THOMAS CNET LOGGED OUT 05/05/72  1204.7 EDT FRI
CPU USAGE 19 SEC
↑BHANGUP
```

* Logout of MULTICS.

* Type "!Q" to return to local mode.

```
-NAMES

M               MIT-MULTICS
UCLA            UCLA-NMC
A               BBN
R               RAND-CSG

-
↑C FROM MULTI-TELNET
@CONT

TALK
NAME: R

LOGO
KILLED JOB 2, USER BTHOMAS, ACCT 1, TTY 35, AT  5/05/72  907
  USED 0:0:2 IN 0:11:12
```

* Type ↑C while in local mode.
* Causes return to local TENEX
* EXEC. Then "continue".

```
-TALK
NAME: A

1  CHAR OUTPUT --- WANT IT? Y

@LOGO
KILLED JOB 12, USER NETPLANES, ACCT 11514, TTY 101, AT  5/05/72 1157
  USED 0:0:3 IN 0:12:17

-QUIT

MULTI-TELNET QUITTING

@
```

* Finish session by logging out
* of BBN and RAND-CSG.